

REMARKS

Claims 1-19 and 21-61 are pending in the above-captioned patent application after this amendment. Claims 1-61 have been rejected.

The Applicants respectfully disagree with the rejection of claims 1-61. However, the Applicants have amended claims 19, 21, 33 and 50, and cancelled claim 20 without prejudice with this amendment for the purpose of expediting the patent application process in a manner consistent with the goals of the Patent Office (65 Fed. Reg. 54603), and/or to clarify what the Applicants regard as the present invention. Further, claims 11, 26, 37, 43, 44, 56 and 61 have been amended to correct typographical and/or grammatical errors, and not to overcome any stated rejection. Additionally, the Applicants have made certain amendments to the specification to correct certain typographical and/or grammatical errors.

Support for the amendments to claims can be found throughout the originally filed specification. In particular, support for the amendments to the claims can be found in the specification at page 18, lines 15-33, in the original claims, and in Figure 3.

No new matter is believed to have been added by this amendment. Reconsideration of the pending application is respectfully requested.

Consideration of New Translations

The Applicants respectfully request that the Examiner specifically indicate that translations of the references submitted in the Supplemental Information Disclosure Statement dated December 4, 2003 were considered. While the references submitted as part of the Supplemental Information Disclosure Statement dated December 4, 2003 are based on the same foreign references as the references submitted as part of the Supplemental Information Disclosure Statement dated October 13, 2003, they are separate translations of the foreign references. Accordingly, the Applicants respectfully submit that it is appropriate for the Examiner to indicate that the subsequently filed translations were considered by the Examiner.

Rejections Under 35 U.S.C. § 102(b)

Claims 1, 3-9, 19, 20, 22-25, 33, 37, 39, 40, 43-46, 48-50, 54-57, 60 and 61

Claims 1, 3-9, 19, 20, 22-25, 33, 37, 39, 40, 43-46, 48-50, 54-57, 60 and 61 have been rejected under 35 U.S.C. § 102(b) as being anticipated by the Article "Residual Errors in Laser Interferometry from Air Turbulence and Nonlinearity" by Norman Bobroff (the "Article"). The Applicants respectfully traverse the rejection of claims 1, 3-9, 22-25, 43-46, 48, 49, 56, 57, 60 and 61. Additionally, the Applicants respectfully submit that the rejection of claims 19, 33 and 50, as amended, is unsupported by the art and should be withdrawn. Claim 20 has been cancelled without prejudice.

More particularly, the Examiner contends that the Article provides in Figures 1 and 2 an interferometer measuring arrangements that prevent incorrect measurement due to environmental conditions, with a beam splitter coated to reduce contamination, with beams that are rotatable through a $\lambda/2$ plate, and with redirectors (prisms) and reflectors (shaded components). The Examiner further contends that the measurement position of the stage is obtained as claimed, with the position of the stage along the second axis measured by the second system from the sum of the position of the stage measured by the first system. Additionally, the Examiner contends that Figure 6 shows another arrangement with two sources that measure the linear and angular displacement of the stage.

The Applicants provide that Figure 1 of the Article is directed to an interferometer including: a two-frequency laser that generates frequency components with opposite circular polarizations; a polarizing beam splitter that separates the components into measurement and reference arms, with contamination of the pure frequency states occurring because the beam splitter coating is not 100% efficient and because the laser output may have a slight elliptical polarization; a $\lambda/4$ plate in each arm that rotates the polarization vectors, converting them to linear polarizations; and mirrors that reflect each component back through the $\lambda/4$ plate through the beam splitter so that the components recombine at a detector. (Section II, page 2677, columns 1 and 2, and in Figure 1). The Applicants further provide that Figure 2 of the Article is directed to a pair of interferometers wherein the beam from a single laser is distributed to each interferometer by a polarizing beam splitter, and wherein the beams each pass through a rotatable $\lambda/2$ plate that is

adjusted to orient precisely the polarization states of the beam. A primary feature of this apparatus is the parallel orientation of the measurement arms achieved by total internal reflection in two right angle prisms and through the use of mirrors (the enclosed area in the figure). (Section II, page 2678 columns 1 and 2, and in Figure 2).

In each apparatus, the instrument is enclosed so that air currents do not disturb the optical elements. In the experiments described, the airflow is restricted by apertures to prevent it from exerting pressure on the optical mounts. (Section II, page 2679, column 1, and Section III, page 2679, columns 1 and 2). Further, the Applicants provide that Figure 6 is directed to a system that includes three independent interferometers to monitor the translational and rotational degrees of freedom of a precision stage. Two of the interferometers individually measure movement in the X direction (S1 and S2), and when the measurements are combined the total movement in the X direction can be calculated as $(S1+S2)/2$, and the rotational movement can be calculated as $(S1-S2)/D$. The third interferometer individually measures movement in the Y direction. (Section III, page 2680, column 2, and in Figure 6).

However, the Article does not disclose a redirector that is secured to a stage and that redirects the path of the beam at 90 degrees from the original path, wherein the redirector is insensitive to rotation about an axis. In the Article, the $\lambda/2$ plates and not the beam splitters are described as rotatable, but the beams pass straight through the $\lambda/2$ plates with only the polarization of the beam being altered. Accordingly, the $\lambda/2$ plates can not be viewed as redirectors that redirect the path of the beam by 90 degrees. Further, the Article does not disclose a first system comprising a first beam, wherein the first system measures the sum of the position of the stage along the first axis and along the second axis. Each interferometer as discussed in the Article is designed to measure movement along one axis only, and only in combination and through performing a calculation with inputs into an equation can movement in another degree of freedom be determined.

Additionally, the Article does not disclose a shield positioned adjacent to the path of the beam to inhibit environmental conditions from influencing the beam. In the Article, the coating provided on the beam splitter is present for the purpose of polarizing the frequency states of the beam. Further, the enclosure provided in the Article is for the entire instrument in question (see Section II, page 2679, column 1, and Section III, page 2679,

column 1), so as to prevent air currents from disturbing the optical elements, and there is no teaching or suggestion of the enclosure being positioned adjacent to the path of the beam to inhibit environmental conditions from influencing the beam.

In distinction to the Article, claim 1 recites “(a) measurement system for measuring the position of a stage, the measurement system comprising: a first system comprising a first beam source that directs a first beam on a first path and a first redirector that is secured to the stage, the first redirector redirecting the first beam so that the redirected first beam is on a first redirected path that is 90 degrees from the first path even if the first redirector is rotated a small angle about an axis.”

Because the Article does not disclose all of the elements of claim 1, the § 102(b) rejection is unsupported by the art and should be withdrawn. Further, because claims 3-9 depend either directly or indirectly from claim 1, the rejection of claims 3-9 is also unsupported by the art and should be withdrawn.

Additionally, in distinction to the Article, claim 19 recites “(a) measurement system ... comprising: a first system comprising a first beam source that directs a first beam on a first path that is parallel to a second axis; and a first redirector secured to the stage, the first redirector redirecting the first beam so that the redirected first beam is on a first redirected path that is parallel to the first axis, wherein the first system measures the sum of the position of the stage along the first axis and along the second axis, wherein the first redirected path is 90 degrees from the first path even if the first redirector is rotated approximately 0.1 degree about a third axis.”

Because the Article does not disclose all of the elements of claim 19, the § 102(b) rejection is unsupported by the art and should be withdrawn. Further, because claims 22-25 depend either directly or indirectly from claim 19, the rejection of claims 22-25 is also unsupported by the art and should be withdrawn.

Further, in distinction to the Article, amended claim 33 recites “(a) combination ... comprising: a stage that retains the device; a stage mover assembly that moves the stage; and a measurement system for measuring the position of the stage, the measurement system comprising a first system including a first beam source that directs a beam at the stage and a shield positioned adjacent to a path of the beam that inhibits environmental conditions from influencing the beam.”

Because the Article does not disclose all of the elements of amended claim 33, the § 102(b) rejection is unsupported by the art and should be withdrawn. Further, because claims 37, 39 and 40 depend either directly or indirectly from amended claim 33, the rejection of claims 37, 39 and 40 is also unsupported by the art and should be withdrawn.

Additionally, in distinction to the Article, claim 43 recites “(a) method for measuring the position of a stage ... comprising the steps of: directing a beam on a first path with a beam source; and redirecting the beam with a redirector that is secured to the stage, the redirector redirecting the beam so that the redirected beam is on a redirected path that is 90° from the first path even if the redirector is rotated approximately 0.1° about an axis.”

Because the Article does not disclose all of the elements of claim 43, the § 102(b) rejection is unsupported by the art and should be withdrawn. Further, because claims 44-46, 48 and 49 depend either directly or indirectly from claim 43, the rejection of claims 44-46, 48 and 49 is also unsupported by the art and should be withdrawn.

Still further, in distinction to the Article, amended claim 50 recites “(a) method ... comprising the steps of: providing a stage that retains the device; moving the stage with a stage mover assembly; and measuring the position of the stage with a measurement system, the measurement system comprising a beam source that directs a beam at the stage and a shield positioned adjacent to a path of the beam that inhibits environmental conditions from influencing the beam.”

Because the Article does not disclose all of the elements of amended claim 50, the § 102(b) rejection is unsupported by the art and should be withdrawn. Further, because claims 54 and 55 depend either directly or indirectly from amended claim 50, the rejection of claims 54 and 55 is also unsupported by the art and should be withdrawn.

Yet further, in distinction to the Article, claim 56 recites “(a) measurement system ... comprising: a first system having a first redirector that is secured to the stage, the first system directing a first beam to the first redirector on a first path that is parallel with a second axis, and the first redirector redirecting the first beam on a first redirected path that is parallel with the first axis; and a reflector that is positioned away from the stage, the first reflector extending along the second axis; wherein the first redirector redirects the first beam at the reflector and the reflector reflects the first beam back at the first

redirector; and the first redirector is configured to be insensitive to the rotation around a third axis that is orthogonal to the first and second axes about the direction redirecting the first beam from the first path.”

Because the Article does not disclose all of the elements of claim 56, the § 102(b) rejection is unsupported by the art and should be withdrawn. Further, because claims 57, 60 and 61 depend either directly or indirectly from claim 56, the rejection of claims 57, 60 and 61 is also unsupported by the art and should be withdrawn.

Rejections Under 35 U.S.C. § 103(a)

Claims 17, 18, 31, 32, 41 and 42

Claims 17, 18, 31, 32, 41 and 42 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over the Article in view of Iwamoto et al. (EP 1168084). The Applicants respectfully submit that the rejection of claims 17, 18, 31, 32, 41 and 42 is unsupported by the art and should be withdrawn.

As noted above, the rejection of claim 1 is unsupported by the art. Therefore, claim 1 negates a prima facie showing of obviousness with respect to the cited combination of references. Accordingly, claims 17 and 18, which indirectly depend from claim 1, are patentably distinguishable over the cited combination of references.

Additionally, as noted above, the rejection of claim 19 is unsupported by the art. Therefore, claim 19 negates a prima facie showing of obviousness with respect to the cited combination of references. Accordingly, claims 31 and 32, which indirectly depend from claim 19, are patentably distinguishable over the cited combination of references.

Further, as noted above, the rejection of amended claim 33 is unsupported by the art. Therefore, amended claim 33 negates a prima facie showing of obviousness with respect to the cited combination of references. Accordingly, claims 41 and 42, which indirectly depend from claim 33, are patentably distinguishable over the cited combination of references.

Claims 6, 10-19, 26-36, 41, 42, 47, 51-53 and 59

Claims 6, 10-19, 26-36, 41, 42, 47, 51-53 and 59 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over the Article in view of Hamada et al. (JP 2001-

307983) ("Hamada et al."). The Applicants respectfully submit that the rejection of claims 6, 10-18, 47, 51-53 and 59 is unsupported by the art and should be withdrawn. Additionally, the Applicants respectfully traverse the rejection of claim 19. Further, the Applicants respectfully submit that the rejection of claim 33, as amended, is unsupported by the art and should be withdrawn.

In particular, the Examiner contends that the Article, in Table 1, discloses the results of using an enclosed (shielded) system and an unenclosed system. The Examiner further contends that Hamada et al. discloses enclosing at least part of the beam, and that part of the measuring system may ride or evidently rest on the stage as it is moved. Additionally, the Examiner contends that Hamada et al. discloses the use of plural measuring sources in Figure 4.

The Applicants provide, as discussed more fully above, that the Article does not teach or suggest the enclosure being positioned adjacent to the path of the beam to inhibit environmental conditions from influencing the beam.

Additionally, the Applicants provide that Hamada et al., in Figures 2-4, is directed to a measurement system for measuring the movement and positioning of a stage. As illustrated, the measurement system uses three interferometer units 81, 82, 83 mounted on stage PST to each measure movement of the stage PST along one axis, with interferometer units 81, 82 measuring movement along the X axis and interferometer unit 83 measuring movement along the Y axis. For each interferometer unit 81, 82, 83, the laser light L1, L2, L3 exits from the laser light source in interferometer receiver 78 and is reflected toward the interferometer unit 81, 82, 83 by a reflective mirror 91, 92, 93 that is mounted on Y carriage 72 that moves in the Y direction together with the stage PST along Y guide 71. At the interferometer unit 81, 82, 83, the laser light L1, L2, L3 is divided by a polarizing beam splitter into a transmitted light component and a reflected light component, with each component then passing through a 1/4 wave plate 98, 99, being reflected by either reference mirror 96 or long mirror 75, being made incident on corner cube 97, and ultimately being reflected by reflective mirror 91, 92, 93 back to the interferometer receiver 78 for detection. (Hamada et al. paragraphs 25-33, and in Figures 2-4).

However, Hamada et al. does not disclose the use of a shield positioned adjacent to the path of the beam to inhibit environmental conditions from influencing the beam.

Hamada et al. makes no mention of utilizing a shield or otherwise protecting the beam from the influence of environmental conditions.

As noted above, the rejection of claim 1 is unsupported by the art. Therefore, claim 1 negates a prima facie showing of obviousness with respect to the cited combination of references. Accordingly, claims 6 and 10-18, which either directly or indirectly depend from claim 1, are patentably distinguishable over the cited reference.

Additionally, in distinction to the cited combination of references, claim 19 recites "(a) measurement system ... comprising: a first system comprising a first beam source that directs a first beam on a first path that is parallel to a second axis; and a first redirector secured to the stage, the first redirector redirecting the first beam so that the redirected first beam is on a first redirected path that is parallel to the first axis, wherein the first system measures the sum of the position of the stage along the first axis and along the second axis, wherein the first redirected path is 90 degrees from the first path even if the first redirector is rotated approximately 0.1 degree about a third axis."

Because the cited combination of references does not disclose all of the elements of claim 19, the § 103(a) rejection is unsupported by the art and should be withdrawn. Further, because claims 26-32 depend indirectly from claim 19, the rejection of claims 26-32 is also unsupported by the art and should be withdrawn.

Further, in distinction to the cited combination of references, amended claim 33 recites "(a) combination ... comprising: a stage that retains the device; a stage mover assembly that moves the stage; and a measurement system for measuring the position of the stage, the measurement system comprising a first system including a first beam source that directs a beam at the stage and a shield positioned adjacent to a path of the beam that inhibits environmental conditions from influencing the beam."

Because the cited combination of references does not disclose all of the elements of amended claim 33, the § 103(a) rejection is unsupported by the art and should be withdrawn. Further, because claims 34-36, 41 and 42 depend either directly or indirectly from amended claim 33, the rejection of claims 34-36, 41 and 42 is also unsupported by the art and should be withdrawn.

Additionally, as noted above, the rejection of claim 43 is unsupported by the art. Therefore, claim 43 negates a prima facie showing of obviousness with respect to the

cited combination of references. Accordingly, claim 47, which indirectly depends from claim 43, is patentably distinguishable over the cited combination of references.

Still further, as noted above, the rejection of amended claim 50 is unsupported by the art. Therefore, amended claim 50 negates a prima facie showing of obviousness with respect to the cited combination of references. Accordingly, claims 51-53, which directly depend from claim 50, are patentably distinguishable over the cited combination of references.

Yet further, as noted above, the rejection of claim 56 is unsupported by the art. Therefore, claim 56 negates a prima facie showing of obviousness with respect to the cited combination of references. Accordingly, claim 59, which directly depends from claim 56, is patentably distinguishable over the cited combination of references.

Claims 2, 21, 38 and 58

Claims 2, 21, 38 and 58 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over the Article as applied to claims 1, 19, 33 and 50 above, and further in view of the Article in Optic Guides 5, Penta Prisms (the "Penta Prisms Article"). The Applicants respectfully submit that the rejection of claims 2, 21, 38 and 58 is unsupported by the art and should be withdrawn.

As noted above, the rejection of claim 1 is unsupported by the art. Therefore, claim 1 negates a prima facie showing of obviousness with respect to the cited combination of references. Accordingly, claim 2, which directly depends from claim 1, is patentably distinguishable over the cited combination of references.

Additionally, as noted above, the rejection of claim 19 is unsupported by the art. Therefore, claim 19 negates a prima facie showing of obviousness with respect to the cited combination of references. Accordingly, claim 21, which indirectly depends from claim 19, is patentably distinguishable over the cited combination of references.

Further, as noted above, the rejection of amended claim 33 is unsupported by the art. Therefore, amended claim 33 negates a prima facie showing of obviousness with respect to the cited combination of references. Accordingly, claim 38, which indirectly depends from claim 33, is patentably distinguishable over the cited combination of references.

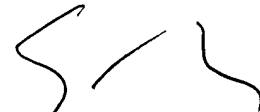
Still further, as noted above, the rejection of claim 56 is unsupported by the art. Therefore, claim 56 negates a prima facie showing of obviousness with respect to the cited combination of references. Accordingly, claim 58, which directly depends from claim 56, is patentably distinguishable over the cited combination of references.

Conclusion

In conclusion, the Applicants respectfully assert that claims 1-19, and 21-61 are patentable for the reasons set forth above, and that the application is now in a condition for allowance. Accordingly, an early notice of allowance is respectfully requested. The Examiner is requested to call the undersigned at 858-456-1951 for any reason that would advance the instant application to issue.

Dated this 23rd day of April, 2005.

Respectfully submitted,



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